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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/895,687	06/29/2001	Kenneth R. Butcher	SE-30	6904

28205 7590 11/03/2004

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EXAMINER

RUTHKOSKY, MARK

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 11/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/895,687	Applicant(s) BUTCHER ET AL.	
	Examiner Mark Ruthkosky	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 3-17 and 20-28 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 21-23 is/are allowed.
- 6) ☐ Claim(s) 3-17, 20 and 24-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
 Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
 Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 102

The rejection of claims 1, 2, 18, 19, and 28 under 35 U.S.C. 102(b) as being anticipated by Carlstrom, Jr. et al. (US 6,015,633) has been overcome by the applicant's amendment.

Claims 1, 2, 18, and 19 have been canceled by the amendment. Amended claim 28 is rejected as noted below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3, 4, 11, 20 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlstrom, Jr. et al. (US 6,015,633), as applied above, in view of Roberts et al. (US 5,458,837.)

The instant claims are to a system for humidifying a gas, such as a gas used in a fuel cell, comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing. The assembly includes a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber.

Carlstrom, Jr. et al. (US 6,015,633) teaches a system for humidifying a gas used in a fuel cell comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing. The assembly includes a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The humidified gas is used to hydrate the polymer electrolyte membrane of the fuel cell (col. 4, lines 30-40.)

With regard to claims 3, 4, 11 20 and 28, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, ceramic material. Porous, ceramic wicking materials are well described in the art. For example, Roberts et al. (US 5,458,837) teaches a ceramic wick material for transferring liquids including a mixture of a ceramic material, a dispersion agent and a binding agent. Alumina, zirconium and silicon compounds are noted as ceramic materials (see col. 5, line 40- col. 6, line 30; col. 22, lines 60-end.) It would be obvious to one of ordinary skill in the art at the time the invention was made to incorporate a ceramic wick in the invention of Carlstrom, Jr. et al. (US 6,015,633), as the material is known in the art to transfer liquids, such as water, in a wicking manner. Carlstrom, Jr. et al. (US 6,015,633) teaches one of ordinary skill in the art to use wicking materials in order to humidify a gas stream and one of ordinary skill in the art will recognize from the teachings of Roberts et al. (US 5,458,837) that ceramic wicks will allow for the transfer of water from a water source through the wick. Claims 4 and 11 are product by process claims where the product is

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prepared by a process of mixing materials. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 3, 5, 6, 7, 12, 13, 14, 20 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlstrom, Jr. et al. (US 6,015,633), as applied above, and further in view of Vic (GB 2,162,680.)

Carlstrom, Jr. et al. (US 6,015,633) teaches a system for humidifying a gas used in a fuel cell comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing, with the assembly including a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The humidified gas is used to hydrate the polymer electrolyte membrane of the fuel cell (col. 4, lines 30-40.)

With regard to claims 3, 5, 6, 12, 13, and 20, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, metal material. Metallic wicks are well described in the art. Vic (GB 2,162,680) teaches wicking materials of

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porous iron and nickel. The wicks have a porosity of 50-95% (page 1, col. 2.) It would be obvious to one of ordinary skill in the art at the time the invention was made to incorporate a porous, metallic wick in the invention of Carlstrom, Jr. et al. (US 6,015,633), as the material is known in the art to transfer liquids in a wicking manner. Carlstrom, Jr. et al. (US 6,015,633) teaches one of ordinary skill in the art to use wicking materials in order to humidify a gas stream and one of ordinary skill in the art will recognize from the teachings of Vic (GB 2,162,680) that porous, metallic wicks will allow for the transfer of water through the wick. It would further be obvious to adjust the porosity of the wick in order to allow for specific amounts of liquid to be passed through the porous wick. As Vic teaches the porosity volume to be 50-90%, it would be obvious to one of ordinary skill in the art to adjust the porosity of a metallic wick to the degree taught in order to transfer the liquid. Claims 5, 6, 12 and 13 are product by process claims where the product is prepared by a process of mixing materials. MPEP 2113 states, "Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." The artesian would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 3-17, 20, and 24-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Carlstrom, Jr. et al. (US 6,015,633), as applied above, and further in view of Seidenberg (US 4,765,396.)

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Carlstrom, Jr. et al. (US 6,015,633) teaches a system for humidifying a gas used in a fuel cell comprising a housing defining a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing, the assembly including a source of humidifying liquid and a porous wick for carrying the humidifying liquid from the source into the chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The humidified gas is used to hydrate the polymer electrolyte membrane of the fuel cell (col. 4, lines 30-40.)

With regard to claims 3, 4, 11 and 20, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, ceramic material. With regard to claims 3, 5, 6, 12, 13, and 20, the reference is silent to the composition of the wick, and therefore, does not teach a porous wick comprising a porous, metal material. Seidenberg (US 4,765,396) teaches that ceramic and metallic porous wicks are well described in the prior art (col. 2.) Various metals and ceramics are noted. The prior art uses wicks to transfer heat, however one of ordinary skill in the art would recognize that these wicks may be used to transfer fluids in the fuel cell taught by Carlstrom, Jr. It would be obvious to one of ordinary skill in the art at the time the invention was made to incorporate a porous, metallic or ceramic wick in the invention of Carlstrom, Jr. et al. (US 6,015,633), as the material is known in the art to transfer fluids in a wicking manner. Carlstrom, Jr. et al. (US 6,015,633) teaches one of ordinary skill in the art to use wicking materials in order to humidify a gas stream and one of ordinary skill in the art will

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recognize from the teachings of Seidenberg (US 4,765,396) that porous, metallic and ceramic wicks will allow for the transfer of water through the wick.

With regard to claims 7-10, 14-17, and 24-27 the reference is silent to the composition of the wick, and therefore, does not teach the wick comprises a specific void volume, a specific void diameter or that the voids are in a substantially circular shape at the window of each void intersection. Seidenberg (US 4,765,396), however, teaches interconnecting, porous wicks with including a void volume of greater than 50% and a pore diameter of 10-12 μm (col. 5, lines 27-end.) In addition, the reference teaches that one of ordinary skill in the art understands the significance of pore size and pore volume in a wick. When a pore size is small, capillary action increases, the permeability of the wick to radial and longitudinal fluid flow decreases, and the tendency to clog increases. Uniform porosity will allow for uniform flow and pressure. It would be obvious to one of ordinary skill in the art at the time the invention was made to adjust the void volume and the pore sizes of the wick taught in Carlstrom, Jr. et al. (US 6,015,633) in order to achieve a desired degree of humidity in the fuel cell. One of ordinary skill in the art would recognize from the teachings of Carlstrom, Jr. et al. (US 6,015,633) that the porous wicking material will act as a damper for supplying water to the fluid flow of reactant gasses which will be adjusted to regulate and distribute water in a fuel cell reactant gas stream. One of ordinary skill in the art would recognize from the teachings of Seidenberg (US 4,765,396) that the pore size and volume of the wick may be adjusted in order to adjust the flow of fluid through the wick. Thus, changes in pore size and volume would be obvious to one of ordinary skill in the art.

With regard to the limitation that the voids are in a substantially circular shape at the window of each void intersection, the prior art of record does not teach the shape of the pores. Using the limitation “substantially circular” is considered to encompass all pore shapes as they are noted to have a uniform pore size, which is indicative of a diameter, however, the shape of the pores is considered obvious (MPEP 2144.04(d)). The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Claims 4, 5, 6, 11, 12 and 13 are product by process claims where the product is prepared by a process of mixing materials. MPEP 2113 states, “Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” The artisan would have found the claimed invention to be obvious in light of the teachings of the references.

Allowable Subject Matter

Claims 21-23 are allowed.

The following is an examiner’s statement of reasons for allowance:

The instant claims include are to a method for humidifying reactant gasses used in a fuel cell including a fuel cell structure with a humidification chamber adjacent to a humidification assembly and separated by a ceramic wick. The method of claim 21 includes forming a ceramic wick made by mixing water, nitric acid, hollow polymer spheres and zirconium, alumina or silica ceramic materials. Instant claim 22 includes a method of forming a metallic wick by adding a

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metallic material to a binding agent, water, and hollow polymer spheres. The prior art does not teach a method of humidifying gasses wherein a porous wick is formed from a mixture of water, nitric acid, hollow polymer spheres and a zirconium, alumina or silica ceramic material OR a mixture of a metallic material, a binding agent, water, and hollow polymer spheres. The most pertinent prior art has been cited. As the prior art does not teach such a method, the claims are allowable in scope over the prior art.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

Applicant's arguments filed 8/13/2004 have been fully considered but they are not persuasive.

The applicant argues that the examiner has impermissibly used "that which the inventor taught against its teacher," (page 10 of the response.) The applicant admits that the prior art reference to Carlstrom, Jr. teaches system for humidifying a gas used in a fuel cell, which includes a humidification chamber through which a gas travels and a humidification assembly adjacent to the housing that includes a humidifying liquid source and a porous wick for carrying the humidifying liquid from the source into the chamber. The applicant, however, argues that one of ordinary skill in the art would be disinclined, rather than motivated to combine the prior art references because (1) the primary reference to Carlstrom, Jr. specifically teaches that

advantages of a porous fabric wick in a fuel cell gas humidification system thereby teaching away from a system that includes a porous ceramic or metallic wick; and (2) the wicks taught in the secondary references are used for non analogous purposes and are in nonanalogous arts.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

The examiner has noted in the rejection that Carlstrom, Jr. teaches a porous wick for carrying the humidifying liquid from the humidifying source into the humidification chamber. The wick separates the source of humidifying liquid from the humidification chamber such that the humidifying liquid flows through the wick before humidifying the gas traveling through the humidification chamber (see the claims; col. 8, lines 60-col. 9, line 10; col. 13, figs. 4-6 and 13-15.) The wick is included as part of a fluid flow plate that is made of metallic or graphite material and the reference notes that the composition of the wick is such that, "the porous portion of the plate for regulating humidity of the reactant gas *may be a separate* suitable porous material or wicking material, or other material which transmits water," (col. 8, lines 60-66.) This implies that the material may be a porous form of the metallic plate material. The reference gives an example that may comprise a cotton cheesecloth material. The reference further states at the top of column 9, "Desirably, a porous or wicking material comprises small passageways

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therethrough which aid waterflow by capillary action. In addition, hydrophilic and or hydrophobic materials and/or coatings may be suitably employed to aid in the addition and/or removal of water from the turns of the flow channel and to aid in the distribution of water throughout the length of the porous portion.” From these teachings, it would be clear to one of ordinary skill in the art to look to the wicking material art for materials that meet these requirements. Thus, the reconstruction is proper as is based the teachings of the applied art including reasoning that takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure.

The applicant argues that the primary reference to Carlstrom, Jr. specifically teaches advantages of a porous fabric wick (cheesecloth) in a fuel cell gas humidification system thereby teaching away from a system that includes a porous ceramic or metallic wick. The reference does not teach that advantages of a porous fabric wick in a fuel cell gas humidification system. The reference merely states that a porous cotton cheesecloth material is an example that meets the requirements noted. This does not imply that the reference teaches away from a system that includes a porous ceramic or metallic wick. The applicant further notes on embodiment (Fig. 13B), which includes a swelling porous section. This single embodiment does not overcome the teachings of the document as a whole. For example, Figure 14 employs a dense wick and the reference also teaches that the wicking material may be of the same material that the plate including metallic material or a resin impregnated graphite.

The applicant argues that the secondary references used in the rejections are nonanalogous art relative to that of Carlstrom, Jr. In response to applicant's argument that the

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secondary references are nonanalogous art, it has been held that a prior art reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the applicant was concerned, in order to be relied upon as a basis for rejection of the claimed invention. See *In re Oetiker*, 977 F.2d 1443, 24 USPQ2d 1443 (Fed. Cir. 1992). In this case, the references are pertinent to the particular problem with which the applicant was concerned. As previously noted, the reference states at the top of column 9, "Desirably, a porous or wicking material comprises small passageways therethrough which aid waterflow by capillary action. In addition, hydrophilic and or hydrophobic materials and/or coatings may be suitably employed to aid in the addition and/or removal of water from the turns of the flow channel and to aid in the distribution of water throughout the length of the porous portion." From these teachings, it would be clear to one of ordinary skill in the art to look to the wicking material art for materials that meet these requirements. Thus, the wicking art is more than reasonably pertinent to the particular problem with which the applicant was concerned. The references are used to wick various fluids. Roberts et al. (US 5,458,837) teaches a ceramic wicking material for wicking water, which is the fluid to be wicked in Carlstrom, Jr. Vic (GB 2,162,680) teaches a metallic wick for liquids in an electrochemical cell. As the fuel cell of Carlstrom, JR. is an electrochemical cell, the cited reference is considered pertinent to the invention. Seidenberg (US 4,765,396) teaches the use of a wick for flowing liquids by capillary action, which is a requirement of the wicking material as noted in Carlstrom, Jr. Thus, the references are considered pertinent to the teachings of the art as noted in Carlstrom, Jr.

The examiner has considered the arguments based on the record as a whole and deems the arguments to be non-persuasive.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a).

Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mark Ruthkosky whose telephone number is 571-272-1291. The examiner can normally be reached on FLEX schedule (generally, Monday-Thursday from 9:00-6:30.) If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached at 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free.)

Mark Ruthkosky

Primary Patent Examiner

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Mark Ruthkosky
10/29/04